Energy Storage Technologies at AEP

Windiana Conference
July 21, 2010
Tom Weaver

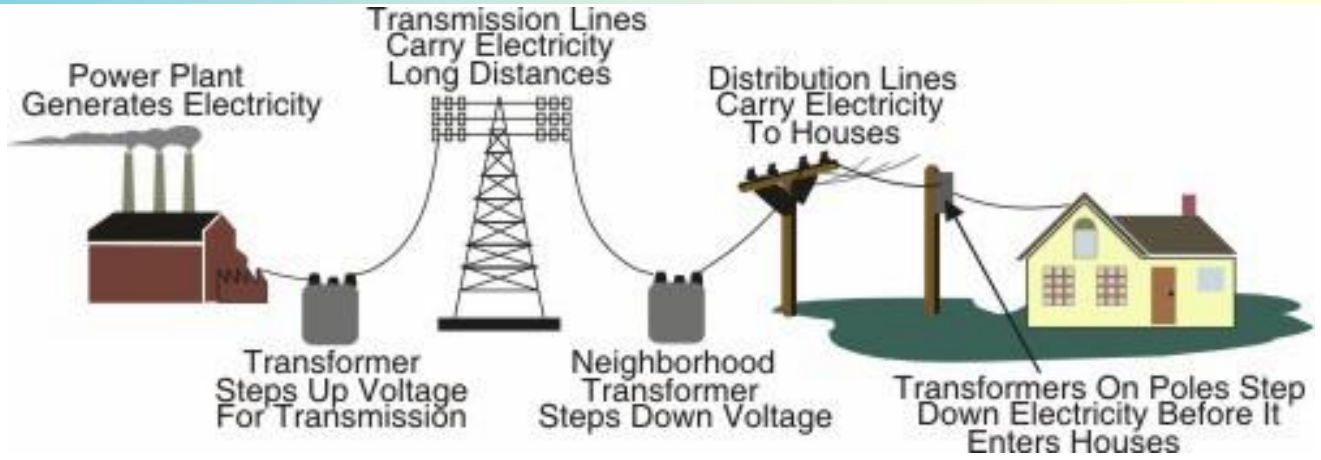
AEP AMERICAN® ELECTRIC POWER

AEP AMERICAN® ELECTRIC POWER

The Evolution of the Electric Utility System

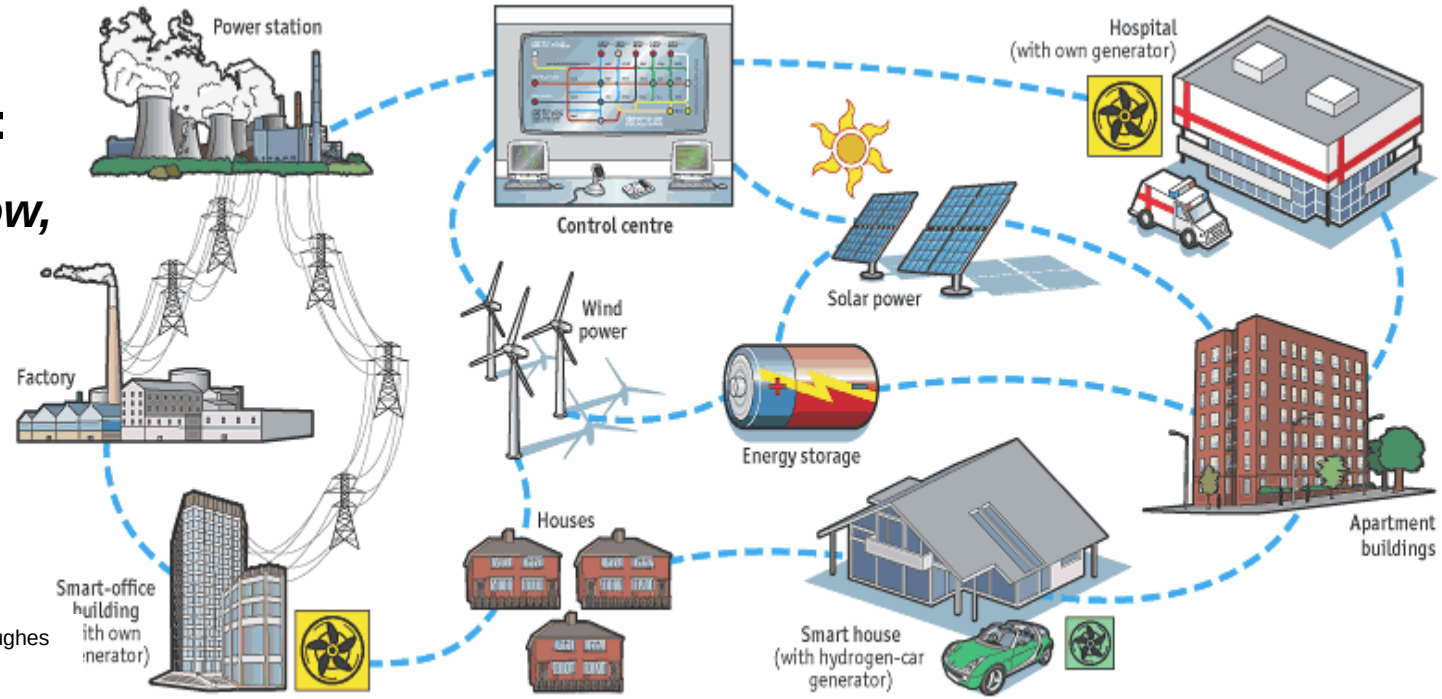
Before Smart Grid:

One-way power flow, simple interactions



After Smart Grid:

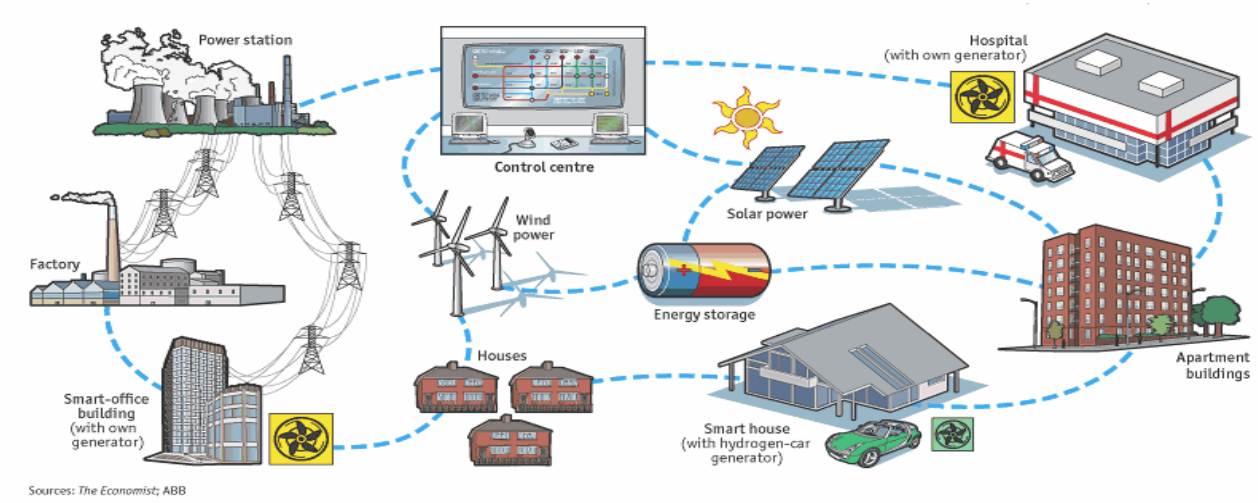
Two-way power flow, multi-stakeholder interactions



Adapted from EPRI Presentation by Joe Hughes
NIST Standards Workshop
April 28, 2008

AEP's "Grid Management" Infrastructure

- Transforming from Single Source Distribution Circuits to an Interconnected Grid with Multiple Sources, Real Time Visualization, Optimization, Automation, and Control.
  - Installation of a distribution management system (SCADA) and the development of a distribution energy management system with visualization tools for "multi-source" distribution operations.
  - Control of voltage and Var to maximize grid efficiency from the generator to the customer
  - Circuit reconfiguration to improve reliability and optimize circuit performance.
  - Accommodate and take full advantage of distributed energy sources including renewables, storage, customer generation, and demand response
  - Installation of remote sensors and automated control devices to provide "real time" analysis of the dispatch of multiple sources on a feeder



AEP AMERICAN ELECTRIC POWER

AEP's Energy Storage Technologies

Substation Scale Battery

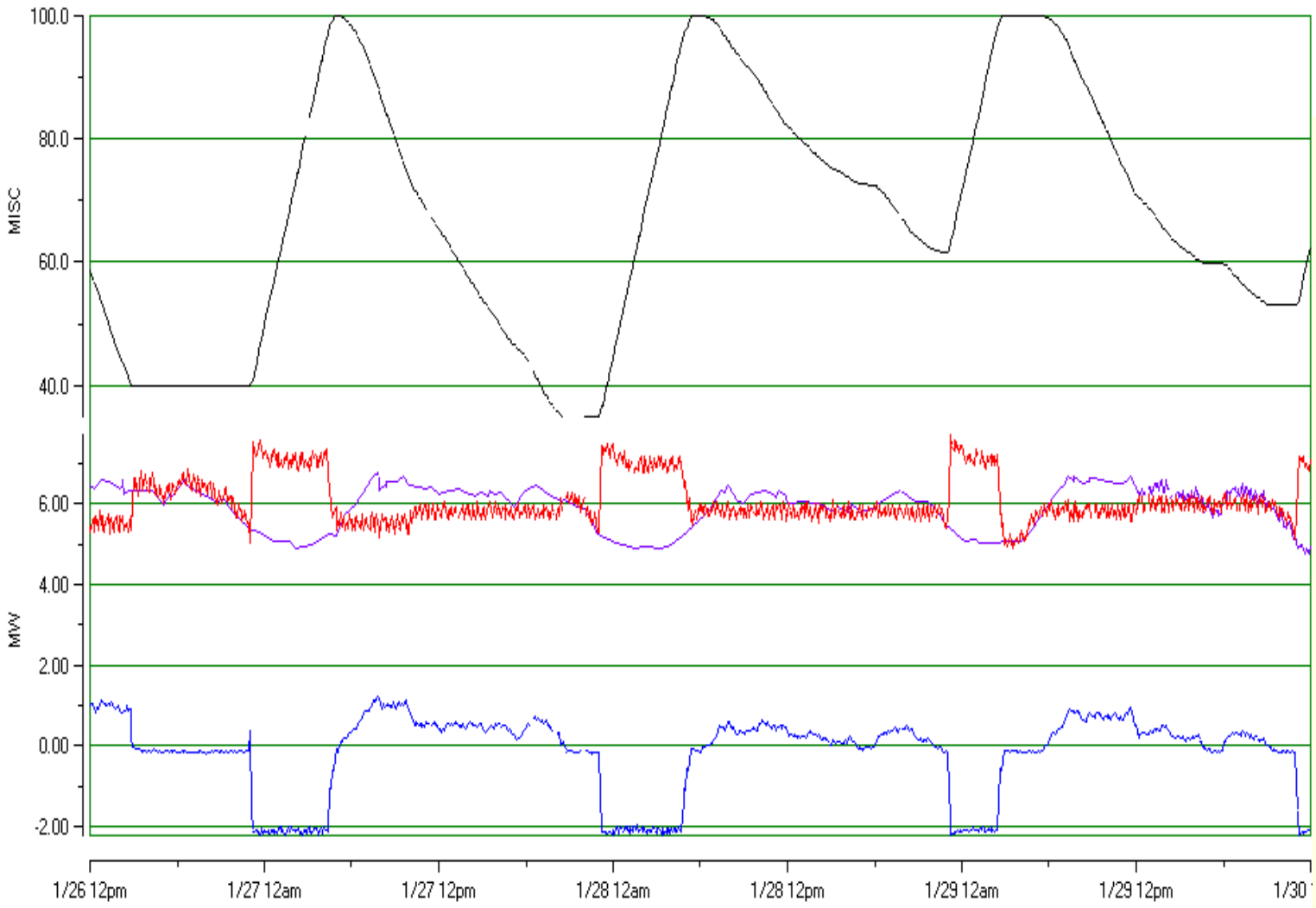
- **2006:** 1 MW, 7.2 MWh; Deferred substation upgrade in Charleston, WV
- **2008:** Three installations; 2 MW, 14.4 MWh each; With "islanding" in Bluffton,OH; Balls Gap,WV; East Busco,IN
- **2010:** 4MW, 25MWh; To be installed in Presidio, TX

Community Energy Storage

- Small distributed energy storage units connected to the secondary of transformers serving a few houses or commercial loads.
- Pursuing development & deployment:

Churubusco, IN NaS 2 MW in Service

Performance at Churubusco - *Jan 26-30, 2009*



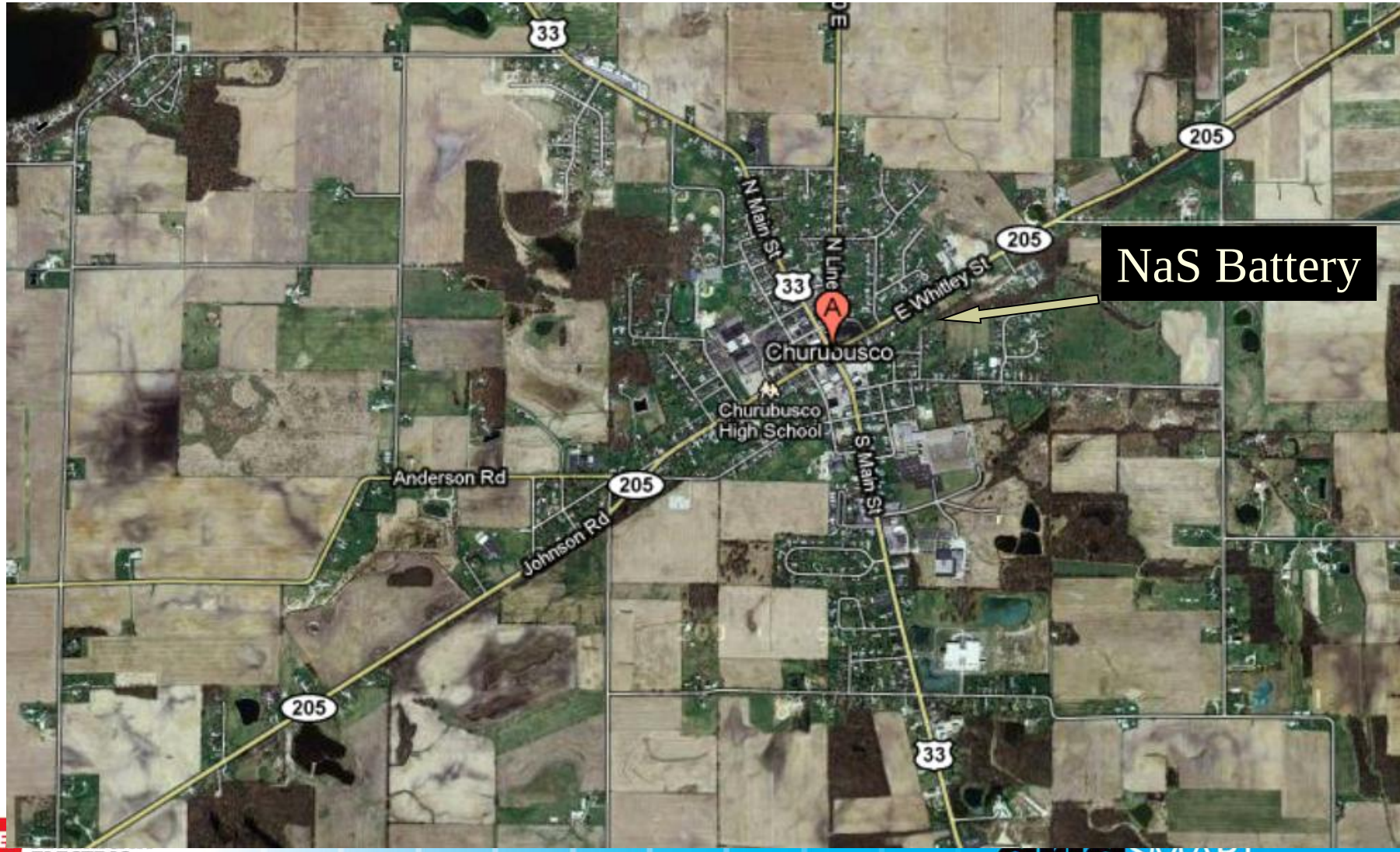
Battery State-of-Charge (%)

Transformer load with battery (MW)

Transformer load without battery (MW)

Battery charge/discharge level (MW)

NaS Islanding – Churubusco, IN



CES Specifications

Key Parameters	Value
Power (active and reactive)	25 kVA / 25 kW
Energy	75 kWh *
Voltage	240 / 120V AC
Battery - PHEV	Li-Ion
Round trip efficiency	> 85%

* Initial Project is using 25 kWh Batteries

AEP Specifications for CES are “OPEN SOURCE” for Public Use and Feedback. During 2009 EPRI hosted free, open webcasts to solicit industry wide input.

www.aeptechcenter.com/ces

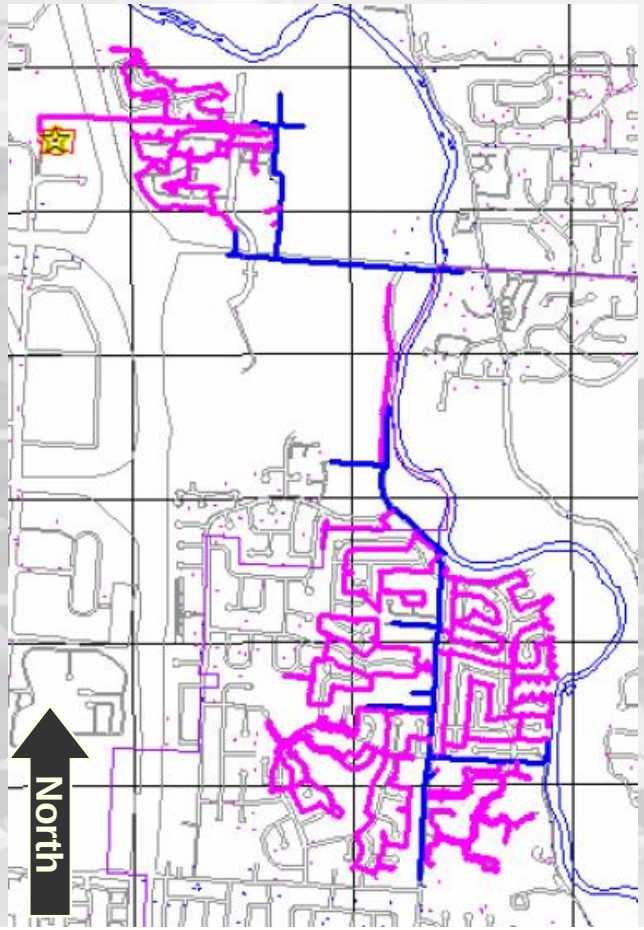
AEP Ohio GridSMART Demonstration - CES

AEP OHIO®
A unit of American Electric Power

- **CES**: 2MW/2MWh; Fleet of 80 25-kW Units
- **Circuit**: Morse Rd 5801; 13 kV, 6.3 MVA Peak Load, 1742 customers
- **Coverage**: Approximately 20% of customers
- **Schedule:**

  Aug 2010 Test Prototypes
  Jun 2011 First 0.5MW
  Nov 2011 Remaining 1.5MW

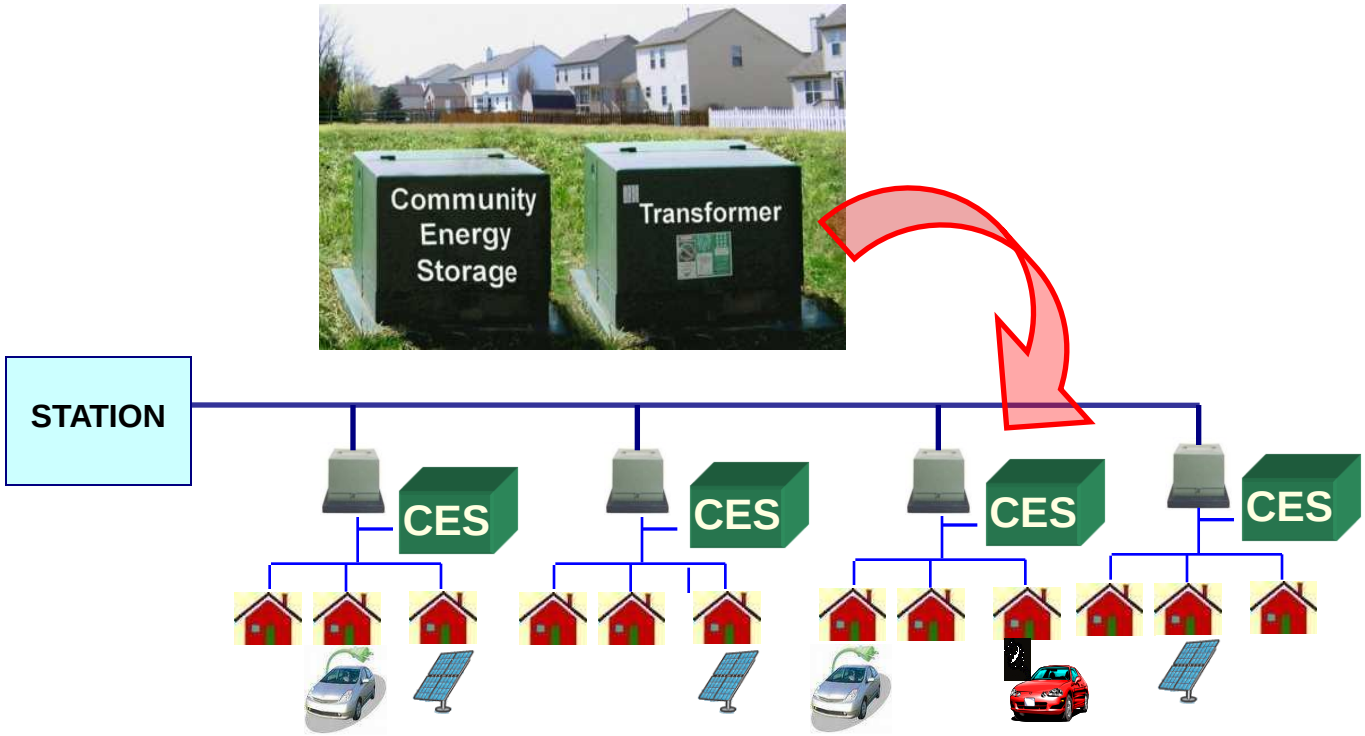
- **Monitor and Evaluate :** 2012 - 2013



Morse Rd 5801

Community Energy Storage (CES)

CES is a distributed fleet of small energy storage units connected to the secondary of transformers serving a few houses or small commercial loads.



Integrating Renewables with Storage

- Energy Storage can optimize the value of Solar & Wind
  - Time shifting
  - Mitigate intermittency and voltage fluctuations
- Integrating wind at Transmission Levels
- No present plans to place wind on the Distribution System – but interested
- Collaborating with EPRI, EEI, SEPA, IEEE and vendors to develop standards for interconnections

Questions?

Tom Weaver – AEP – tfweaver@aep.com

614-716-5829